IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	
Yungtaek Jang *et al.*	
Application No. 10/644,906	Art Unit: 2838
Confirmation No. 6439	Examiner: Riley, Shawn
Filed: August 21, 2003	Atty. Docket No.: 36977-190011
For: FULL BRIDGE POWER CONVERTERS WITH ZERO-VOLTAGE SWITCHING	Customer No. **26694** **PATENT TRADEMARK OFFICE**

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal to the Board of Patent Appeals and Interferences from the Examiner's decision set forth in the Final Office Action dated April 12, 2005. A Response to the Final Action was filed on April 29, 2005 and having received an Advisory Action dated May 27, 2005, Appellants are filing this Brief pursuant to 37 C.F.R. §41.37(c) concurrently with a Notice of Appeal. Please charge the required appeal fee of $500, and any additional fees necessary, or credit any refunds, to our deposit account no. 22-0261.

(1) REAL PARTY IN INTEREST

The Assignee of this Application, and thus the real party of interest in this Appeal is Delta Electronics Inc. having a business address at 186 Ruey Kuang Rd., Neihu, Taipei.

(2) RELATED APPEAL AND INTERFERENCES

No appeal or interferences is known to Appellants, the Appellant's legal representative for Assignee which would directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) STATUS OF CLAIMS

The Application was filed with claims 1-25.

Claims 1-3, 5-16, and 24-25 are finally rejected.

Claims 4 and 17-23 are objected as being based on rejected base claims

Claims 1-25 are appealed and set forth in the Appendix to this Brief.

(4) STATUS OF AMENDMENTS

A Response to Final Office Action was filed requesting reconsideration of the Examiner's decision in the Final Office Action. The Response argued for patentability of the claimed invention in view of the prior art, without amending any of the claims. The Abstract was amended, however, to overcome an objection. The Examiner issued an Advisory Action maintaining the rejection of the claims with explanations to Appellants' Response.

(5) SUMMARY OF THE CLAIMED INVENTION

As shown in FIG. 4 and described starting from Paragraph 35, Page 11, of the specification, independent Claim 1 relates to a power converter that has an input port for receiving an input power source V_{IN} and an output port for supplying current to a load R_L. At least one power transformer TR having a primary side and a secondary side converts input power to output power. A bridge having one or more controllable switching devices on the primary side of the transformer operates under the control of a controller that regulates load current. In the exemplary embodiment shown in FIG. 4, the

bridge comprises leading-leg primary switches Q_1 and Q_2 and lagging-leg primary switches Q3 and Q4. As stated in Paragraph 36, page 11, an alternating energy source isolates the power transformer from the one or more controllable switching devices. In the exemplary embodiment shown in FIG. 4, the alternating source comprises an auxiliary transformer TRA.

(6) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The ground of rejection for review is whether claims 1-3, 5-16, and 24-25 are fully anticipated under 35 U.S.C. 102(b) by U.S. Patent No. 5,563,775 issued to Kammiller (Kammiller)?

(7) ARGUMENT

None of the Claims are anticipated by Kammiller

Anticipation

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "TO ANTICIPATE A CLAIM, THE REFERENCE MUST TEACH EVERY ELEMENT OF THE CLAIM." MPEP 2131

Kammiller Prior Art

Kammiller discloses a full-bridge phase displaced resonant transition circuit having a center-tap placed on a power transformer primary winding. The center-tap is connected to an inductor (14) at one end with another end of the inductor (14) being connected to a large capacitor (16). Kammiller utilizes the energy stored in the inductor (14) to discharge the capacitor (16) across any of the bridge switches before turn on, thereby

achieving ZVS switching. During the time that a diagonal of the switching bridge is conducting, current will increase in the inductance of the power transformer primary winding. When the bridge changes to a horizontal conduction situation, the current in the power transformer primary winding will stop increasing and will essentially hold its value until the next diagonal conduction. Concurrently during the horizontal conduction the current in a resonant inductor will increase. When the bridge changes again to diagonal conduction the resonant inductor will stop increasing and essentially hold its value until the next horizontal conduction. Through this operation, at any given time there is current in one or the other inductances which is increasing and thus storing energy to be used for resonant transition even at zero phase no-load conditions. One of the drawbacks of this arrangement is the requirement for large components to store the required energy.

Claim 1

Independent Claim 1 reads as follows:

1. A power converter, comprising:

an input port for receiving an input power source;

an output port for supplying current to a load;

at least one power transformer having a primary side coupled to said input port and a secondary side coupled to the output port;

a controller for regulating load current;

one or more controllable switching devices on the primary side of the power transformer operating under the control of the controller; and

at least one alternating energy source that isolates the at least one power transformer from said one or more controllable switching devices.

As can be seen, the language of independent Claim 1 expressly requires "an alternating energy source that isolates the power transformer from the controllable switching devices." The present invention uses the energy supplied by the alternating energy source to turn on the controllable switching devices at a substantially zero voltage. Instead of increasing the inductance for storing the necessary energy to discharge junction capacitances, as disclosed in Kammiller, the converter of the present invention increases the amount of current delivered to the primary of the power transformer, without increasing its size. In this way, the present invention reduces the component size of the power converter.

Examiner's Position

The Examiner's position can be summed up by statements made in the Advisory Action in response to Applicant's arguments for distinguishing the claimed invention over Kammiller. In the Advisory Action, the Examiner's states that in Kammiller, "the isolation occurs based on the resonating function of the 14 and 16 and as described in at least figures 3a-3b which show how nodes d vis a vis b function out of synch to create an isolation in the same type of manner as applicants claimed invention." (See Page 2 of Advisory Action, Explanation to Paragraph "4) aplicants [sic] state:")

Except for a cursory reference to FIGs. 3A and 3B, the Examiner has not cited any other part of the Kammiller's specification in support of this position. No where in Kammiller there is any teaching or suggestion for isolating a primary transformer from a bridge. Having searched the entire text of this reference, there is in fact no mention of the words "sync," "isolate" or "isolation" anywhere in Kammiller. Thus, it appears that the

Examiner has arbitrarily interpreted the term "isolate" as somehow involving "resonance" and "out of sync" functions, without any authority.

Canons of Claim Interpretation

During patent examination, the pending claims must be "given their broadest reasonable interpretation consistent with the specification." *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000). However, The broadest reasonable interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach. *In re Cortright*, 165 F.3d 1353, 1359, 49 USPQ2d 1464, 1468 (Fed. Cir. 1999). Claim terms are presumed to have the ordinary and customary meanings attributed to them by those of ordinary skill in the art. *Sunrace Roots Enter. Co. v. SRAM Corp.*, 336 F.3d 1298, 1302, 67 USPQ2d 1438, 1441 (Fed. Cir. 2003); *Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc.*, 334 F.3d 1294, 1298 67 USPQ2d 1132, 1136 (Fed. Cir. 2003)("In the absence of an express intent to impart a novel meaning to the claim terms, the words are presumed to take on the ordinary and customary meanings attributed to them by those of ordinary skill in the art."). It is the use of the words in the context of the written description and customarily by those skilled in the relevant art that accurately reflects both the "ordinary" and the "customary" meaning of the terms in the claims. *Ferguson Beauregard/Logic Controls v. Mega Systems*, 350 F.3d 1327, 1338, 69 USPQ2d 1001, 1009 (Fed. Cir. 2003). The ordinary and customary meaning of a term may be evidenced by a variety of sources, *Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc.*, 334 F.3d 1294, 1298, 67 USPQ2d 1132, 1136 (Fed. Cir. 2003), including: the claims themselves, *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999); dictionaries and treatises, *Tex. Digital Sys., Inc. v.*

Telegenix, Inc., 308 F.3d 1193, 1202, 64 USPQ2d 1812, 1818 (Fed. Cir. 2002); and the written description, the drawings, and the prosecution history, see, e.g., *DeMarini Sports, Inc. v. Worth, Inc.*, 239 F.3d 1314, 1324, 57 USPQ2d 1889, 1894 (Fed. Cir. 2001). If extrinsic reference sources, such as dictionaries, evidence more than one definition for the term, the intrinsic record must be consulted to identify which of the different possible definitions is most consistent with applicant's use of the terms. *Brookhill-Wilk 1*, 334 F. 3d at 1300, 67 USPQ2d at 1137; see also *Renishaw PLC v. Marposs Societa" per Azioni*, 158 F.3d 1243, 1250, 48 USPQ2d 1117, 1122 (Fed. Cir. 1998)

Plain and Ordinary Meaning of Term "Isolate"

According to Merriam-Webster Dictionary Online (www.merriam-webster.com), one plain and ordinary meaning of the word "isolate," consistent with its use in the specification, is "to set apart from others. In other words, "isolate" as understood by one of ordinary skilled in the art to which the present invention pertains is electrical setting apart of two circuits from each other, also known as "decoupling." In other words, the claim language requires the alternating energy source to decouple a power transformer from controllable switching devices."

Since there is no supporting evidence in the record, the Appellants are at a total loss as to how the Examiner has equated the term "isolate" with "resonating" and "out of sync" functions since such interpretation is not consistent with plain and ordinary meaning of the term "isolate" as understood by one of ordinary skill in the art. The Examiner has not cited any reference or authority that would support equating "resonating" and "out of sync" functions with isolation. Moreover, the Kammiller prior art itself provides no teaching or suggestion for such interpretation.

The meaning of the word "resonance" is "a vibration of large amplitude in a mechanical or electrical system caused by a relatively small periodic stimulus of the same or nearly the same period as the natural vibration period of the system." (See Merriam-Webster Dictionary Online at www.merriam-webster.com) There is no indication in Kammiller to interpret this term any other way. As stated above, Kammiller does not use the word "sync" anywhere in the specification. Therefore, in order to understand what the Examiner means by "out of sync," the Appellants have to make certain assumptions. Assuming that the word "sync" is the same as "synchronization," meaning "recurring or operating at exactly the same periods" (See Merriam-Webster Dictionary Online at www.merriam-webster.com), an "out of sync" function would appear to mean waveforms that are not synchronized or waveforms that don't have the same period or time reference. Based on this analysis, what the Examiner in effect is saying is that cyclical waveforms with time references some how isolate or otherwise decouple two circuits, i.e., the "nodes b and d" of Kammiller reference. How the Examiner has reached such conclusion, however, remains unexplained and unsupported by the record.

Regardless, even a plain and cursory look at the curves in FIGs 3A and 3B referred to by the Examiner, i.e., curves A, B, C and D, shows them all to be in fact synchronized by the same time reference, with no difference in their periods--Kammiller's circuit would probably not function if these waveforms were not synchronized. Therefore, waveforms D and B at "nodes b and d" are "in sync," despite what the Examiner claims. So what the Examiner refers to as "resonating" and "out of sync" functions not only has no relevance to the term "isolate" but also amount to a mischaracterization of prior art that is utterly wrong and unsupported on its face.

In the Final Action, the Examiner has characterized Kammiller's Q1-4 (shown in FIG. 2) as the claimed requirements for "one or more controllable switches" and "from 14 through 16 connected to Q1-4" as the "alternating energy source." Therefore, under this characterization, the inductor (14) and capacitor (16) would have to isolate or decouple the power transformer 10 from Q1-4. Put another way, the Examiner's anticipation argument relies on the inductor (14) and capacitor (16), a serial coupled LC circuit, providing isolation or decoupling between the transformer 10 and Q1-4, akin to the isolation provided by the auxiliary transformer TRA of FIG. 4. As is well known and according to the most basic electrical engineering skills and junior engineering courses, a serial LC circuit has no isolating property, for example, the way a transformer does. Generally, such LC circuit acts as a passive filter for coupling two circuits not decoupling them. Thus, the LC circuit formed by the capacitor (16) and inductor (14) not only does not provide any isolation between the transformer 10 and Q1-4, it in fact, couples them to each other, instead of decoupling them as asserted by the Examiner. For the above stated reasons, the Examiner's interpretation of the term "isolate" also does not cure this deficiency because it is not supported by teaching of the prior art, anything on record or rudimentary knowledge in the art.

It is respectfully submitted that the rejection must be reversed because the Examiner has not interpreted the claim terms, e.g., "isolate," in accordance with the governing canons of claim interpretation. The rejection must be reversed because the Examiner has mischaracterized the teachings of the prior art as such teachings would be understood by one of ordinary skill in the art.

(8) CONCLUSION

For the foregoing reasons, it is respectfully submitted that claims 1-3, 5-16, and 24-25 are patentable over Kammiller, because this reference fails to teach or suggest each and every one of the claimed limitations, namely, at least one alternating energy source that isolates the at least one power transformer from said one or more controllable switching devices. For this reason, all the objected dependent are also patentable. Accordingly, the Examiner's rejection of these claims should also be reversed.

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(9) CLAIM APPENDIX

1. (previously amended) A power converter, comprising:
an input port for receiving an input power source;
an output port for supplying current to a load;
at least one power transformer having a primary side coupled to said input port and a secondary side coupled to the output port;
a controller for regulating load current;
one or more controllable switching devices on the primary side of the power transformer operating under the control of the controller; and
at least one alternating energy source that isolates the at least one power transformer from said one or more controllable switching devices.

2. (original) The power converter of claim 1, wherein the energy supplied by said alternating energy source creates a condition to turn on the one or more controllable switching devices at a substantially zero voltage.

3. (original) The power converter of claim 1, wherein the energy supplied by said alternating energy source is dependent on at least one of load current and input power source changes.

4. (original) The power converter of claim 1, wherein the energy supplied by said alternating energy source is independent of current changes within the converter .

5. (original) The power converter of claim 1 further including at least one primary inductor for storing the energy supplied by said alternating energy source.

6. (original) The power converter of claim 5, wherein said at least one primary inductor comprises a single winding.

7. (original) A power converter as in claim 5, wherein said at least one primary inductor comprises a plurality of windings.
8. (original) The power converter of claim 1 further comprising at least one pair of diodes for coupling said alternating energy source to a primary inductor.

9. (original) The power converter of claim 1, wherein the control circuit periodically switches said one or more controllable switching devices.

10. (original) The power converter of claim 1, wherein the control circuit periodically switches said one or more controllable switching devices in response to at least one of load current and input power source changes.

11. (original) The power converter of claim 1, further including a full bridge comprising a first leg that includes a first pair of controllable switching devices and a second leg that includes a second pair of controllable switching devices.

12. (original) The power converter of claim 11, wherein the controller controls the operation of the first pair of controllable switching devices and the second pair of controllable switching devices based on a phase-shift caused by at least one of load current and input power source changes.

13. (original) The power converter of claim 11 further including a first primary inductor for storing energy required to create conditions for switching the first pair of controllable switching devices at substantially reduced voltage, and a second primary inductor for storing energy required to create conditions for turning on the second pair of controllable switching devices at substantially reduced voltage.

14. (original) The power converter of claim 1 further comprising a full-wave rectifier at the secondary side of the power transformer.

15. (original) The power converter of claim 1 further comprising a current doubler rectifier at the secondary side of the power transformer.

16. (original) The power converter of claim 1 further comprising a filter at the secondary side of the power transformer.

17. (original) The power converter of claim 8, wherein said alternating energy source comprises an auxiliary transformer having a first winding and a second winding.

18. (original) The power converter of claim 17, wherein said auxiliary transformer has a leakage inductance for storing the energy that creates the conditions for switching said one or more controllable switching devices at a substantially low voltage.

19. (original) The power converter of claim 17, wherein said first winding of said auxiliary transformer is coupled in series with an energy-storage capacitor; said series combination of said first winding of said auxiliary transformer and said energy-storage capacitor having a first and second terminal; said first terminal connected to a tap of said primary winding of said power transformer and said second terminal connected to a point with a constant potential.

20. (original) The power converter of claim 19, wherein the tap is the center tap of said primary winding of said power transformer.

21. (original) The power converter of claim 17, wherein said first winding of said auxiliary transformer is coupled in series with an energy-storage capacitor; said series combination of said first winding of said auxiliary transformer and said energy-storage capacitor having a first and second terminal; said first terminal

coupled to a junction of said controllable switching devices and said second terminal connected to a point with a constant potential.

22. (original) A power converter as in Claim 17, wherein said second winding of said auxiliary transformer is coupled in series with a primary winding of said power transformer and a primary inductor that is used to store energy supplied by said alternating energy device.

23. (original) The power converter of claim 17, wherein a first diode of said pair of diodes periodically coupling said second winding of said auxiliary transformer to said primary inductor when the voltage across said second winding of said auxiliary transformer is positive; said second diode periodically coupling said second winding of said auxiliary transformer to said primary inductor when the voltage across said second winding of said auxiliary transformer is negative.

24. (previously amended) A power converter as in Claim 14, wherein a combination of said second winding of said auxiliary transformer and said primary winding of said power transformer and said external inductor is coupled between said first and second bridge legs.

25. (original) The power converter of claim 1, wherein a plurality of power transformer are used for power transfer from said input port to said output port, each said power transformer comprising a primary winding and a secondary winding, wherein said primary windings of said power transformers connected in series.